

What is claimed is:

1. An exhaust aftertreatment filter for internal combustion engine exhaust comprising an axially extending cylindrical filter roll comprising pleated filter media defining a plurality of axially extending flow channels, and having a first open-flow section with open flow channels, and a second filtering section with alternately sealed flow channels forcing exhaust to flow through said pleated filter media.
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2. The invention according to claim 1 wherein said open-flow section is a central inner section, and said filtering section is an outer annular section around said inner section.
3. The invention according to claim 1 wherein said filter roll is spiral-wound from a sheet having corrugated serpentine pleats extending axially therealong and providing said pleated filter media having said plurality of axially extending flow channels, and comprising first and second axially spaced sealing beads extending
5 laterally across said pleats and alternately sealing said flow channels, said sheet being wound from a starting side to a terminating side, said beads being laterally spaced from one of said starting and terminating sides to provide unsealed flow channels providing said open-flow section of said filter roll when wound.
4. The invention according to claim 3 wherein said beads are laterally spaced from said starting side.
5. The invention according to claim 3 wherein said beads are laterally spaced from said terminating side.
6. The invention according to claim 1 wherein exhaust flow through said first open-flow section is unfiltered.
7. An exhaust aftertreatment filter for filtering internal combustion engine exhaust flowing along an axial direction, comprising an axially extending cylindrical filter roll having a plurality of concentric layers with pleats therebetween defined by wall segments extending radially in corrugated serpentine manner between pleat tips at
5 axially extending bend lines, said wall segments extending axially between first and second distally opposite axial ends, said wall segments defining axial flow channels therebetween, said filter roll having a central inner section, and an outer annular section

around said inner section, the wall segments of said outer section being alternately sealed to each other by a first set of plugs to define a first set of flow channels closed by
10 said plugs, and a second set of flow channels interdigitated with said first set of flow channels and having open first axial ends, said wall segments of said outer section being alternately sealed to each other by a second set of plugs axially spaced from said first set of plugs and closing said second set of flow channels, said first set of flow channels having open second axial ends, the wall segments of said inner section defining a third
15 set of flow channels open at both the first and second axial ends.

8. The invention according to claim 7 wherein the first axial ends of said wall segments of said inner section are axially recessed from the first axial ends of said wall segments of said outer section.

9. The invention according to claim 8 wherein said filter roll has an inner central face at the first axial ends of said wall segments of said inner section, and an outer annular face at the first axial ends of said wall segments of said outer section, said inner face being spaced axially from said outer face.

10. The invention according to claim 7 further comprising in combination an axially extending housing enclosing said filter roll and having axially distally opposite first and second plenums, an inlet port in said first plenum, an outlet port in said second plenum, such that engine exhaust flows into said first plenum from said first inlet port, and then flows in parallel through said inner and outer sections to said second plenum for exit at said outlet port, said engine exhaust flowing from said inlet plenum through said third set of flow channels from the open first axial ends thereof to the open second axial ends thereof then into said second plenum, said engine exhaust also flowing from said inlet plenum into the open first axial ends of said second set of flow
5 channels and then being filtered by passage through said wall segments of said outer section and then flowing out of the open second axial ends of said first set of flow channels into said second plenum.
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11. The invention according to claim 7 further comprising in combination an axially extending housing enclosing said filter roll and having axially distally opposite first and second plenums, an outlet port in said first plenum, an inlet tube supplying engine exhaust to the first axial end of said inner section to supply exhaust to

5 the first axial ends of said third set of flow channels, such that engine exhaust flows through said third set of flow channels from the open first axial ends thereof to the open second axial ends thereof, then into said second plenum wherein exhaust flow reverses and flows into the open second axial ends of said first set of flow channels and then is filtered by passing through said wall segments of said outer section and flows out of the
10 open first axial ends of said second set of flow channels into said first plenum and then to said outlet port.

12. The invention according to claim 11 wherein said first plenum has an inlet port, and said inlet tube extends from said inlet port through said first plenum to said first axial end of said inner section.

13. The invention according to claim 7 further comprising in combination an axially extending housing enclosing said filter roll and having axially distally opposite first and second plenums, an inlet port in said first plenum, an outlet tube extending from the first axial end of said inner section, such that engine exhaust flows into said first plenum from said inlet port, then into the open first axial ends of said second set of flow channels and then is filtered by passing through said wall segments of said outer section and then flows out of the open second axial ends of said first set of flow channels into said second plenum wherein exhaust flow reverses and flows through said third set of flow channels from the open second axial ends thereof to the open first axial ends thereof, then through said outlet tube.
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14. The invention according to claim 13 wherein said first plenum has an outlet port, and said outlet tube extends from said first axial end of said inner section through said first plenum to said outlet port.

15. The invention according to claim 7 wherein said filter roll is spirally wound from a sheet having said corrugated serpentine pleats thereon, said first and second sets of plugs being provided by first and second axially spaced sealing beads extending laterally across said pleats, said sheet being wound from a starting side to a
5 terminating side, said beads being laterally spaced from said starting side to provide said third set of flow channels as open unsealed flow channels through said inner section of said filter roll when wound.

16. The invention according to claim 15 wherein said sheet has a cut-out section along said starting side and along said first axial end, such that after said winding, the first axial ends of said wall segments of said inner section are axially recessed from the first axial ends of said wall segments of said outer section.

17. A combination catalytic converter and filter for internal combustion engine exhaust comprising an axially extending cylindrical filter roll comprising pleated filter media defining a plurality of axially extending flow channels, and having a first catalytic section treated with a catalyst for said exhaust, and a second filter section with alternately sealed flow channels forcing exhaust to flow through said pleated filter media.

18. The invention according to claim 17 wherein said sections are in parallel such that a first portion of said exhaust flows through said catalytic section and is catalyzed thereby, and a second portion of said exhaust flows through said filter section and is filtered thereby.

19. The invention according to claim 18 wherein exhaust flow through said catalytic section is unfiltered.

20. The invention according to claim 18 further comprising in combination a housing enclosing said filter roll, said housing having an inlet supplying engine exhaust to both of said sections, and an outlet receiving exhaust from both of said sections including a first catalyzed exhaust portion and a second filtered exhaust portion.

21. The invention according to claim 17 wherein said sections are in series such that engine exhaust flow serially through each.

22. The invention according to claim 21 further comprising in combination a housing enclosing said filter roll, said housing having an inlet supplying engine exhaust to one of said sections, and an outlet receiving exhaust from the other of said sections, said exhaust at said outlet being both catalyzed and filtered.

23. The invention according to claim 17 wherein said catalytic section is a central inner portion, and said filter section is an outer annular portion around said inner portion.

24. The invention according to claim 17 wherein said first catalytic section is an open-flow section with open-flow channels.

25. The invention according to claim 24 wherein said axially extending cylindrical filter roll has a plurality of concentric layers with pleats therebetween defined by wall segments extending radially in corrugated serpentine manner between pleat tips at axially extending bend lines, said wall segments extending between first and second distally opposite axial ends, said wall segments defining axial flow channels therebetween, said filter roll having a central inner section providing said catalytic section, and an outer annular section around said inner section and providing said filter section, the wall segments of said outer section being alternately sealed to each other by a first set of plugs to define a first set of flow channels closed by said plugs, and a second set of flow channels interdigitated with said first set of flow channels and having open first axial ends, said wall segments of said outer section being alternately sealed to each other by a second set of plugs axially spaced from said first set of plugs and closing said second set of flow channels, said first set of flow channels having open second axial ends, the wall segments of said inner section defining a third set of flow channels open at both the first and second axial ends.

26. A method of making an exhaust aftertreatment filter for internal combustion engine exhaust, comprising providing a sheet having corrugated serpentine pleats extending axially thereon, axially spacing first and second sealing beads extending laterally across said pleats, spiral-winding said sheet from a starting side to a terminating side to form a cylindrical filter roll having a plurality of concentric layers with pleats therebetween defined by wall segments extending radially in corrugated serpentine manner between pleat tips at axially extending bend lines, said wall segments extending axially between first and second distally opposite axial ends, said wall segments defining axial flow channels therebetween, prior to said winding, laterally spacing said beads from one of said starting and terminating sides, such that after said winding, said filter roll has a filtering section and an unsealed section, said filtering section having the wall segments thereof alternately sealed to each other by a first set of plugs provided by said first bead to define a first set of flow channels closed by said first set of plugs, and a second set of flow channels interdigitated with said first set of flow channels and having open first axial ends, said wall segments of said filtering section being alternately sealed to each other by a second set of plugs provided by said second

bead and axially spaced from said first set of plugs and closing said second set of flow channels, said first set of flow channels having open second axial ends, the wall segments of said unsealed section defining a third set of flow channels open at both the
20 first and second axial ends.

27. The method according to claim 26 comprising laterally spacing said beads from said starting side such that said unsealed section is a central inner section of said filter roll, and said filtering section is an outer annular section of said filter roll around said inner section.

28. The method according to claim 26 comprising laterally spacing said beads from said terminating side.

29. The method according to claim 26 comprising cutting out a section of said sheet along said starting side and along said first axial end, such that after said winding, said filter roll has a first axial end with an inner central face axially recessed from an outer annular face.

30. A method of treating internal combustion engine exhaust comprising providing an axially extending cylindrical filter roll having pleated filter media defining a plurality of axially extending flow channels, directing exhaust flow axially through said filter roll including a first catalytic section treated with a catalyst, and a second filter section with alternately sealed flow channels forcing exhaust to flow through said pleated filter media.
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31. The method according to claim 30 comprising splitting said exhaust flow into parallel portions, and directing a first portion of said exhaust through said catalytic section to be catalyzed thereby, and directing a second portion of said exhaust through said filter section to be filtered thereby.

32. The method according to claim 30 comprising directing said exhaust flow serially through said sections.

33. The method according to claim 32 comprising both catalyzing and filtering all of said exhaust.

34. A method of treating internal combustion engine exhaust comprising providing an axially extending cylindrical filter roll having a plurality of concentric layers with pleats therebetween defined by wall segments extending radially in

corrugated serpentine manner between pleat tips at axially extending bend lines, said
5 wall segments extending axially between first and second distally opposite axial ends,
said wall segments defining axial flow channels therebetween, said filter roll having an
unsealed section and a filtering section, the wall segments of said filtering section being
alternately sealed to each other by a first set of plugs to define a first set of flow
channels closed by said first set of plugs, and a second set of flow channels
10 interdigitated with said first set of flow channels and having open first axial ends, said
wall segments of said filtering section being alternately sealed to each other by a second
set of plugs axially spaced from said first set of plugs and closing said second set of
flow channels, said first set of flow channels having open second axial ends, the wall
segments of said unsealed section defining a third set of flow channels open at both the
15 first and second axial ends, and directing exhaust flow axially through said filter roll.

35. The method according to claim 34 comprising directing exhaust flow
in parallel through said unsealed and filtering sections by directing one portion of said
exhaust flow through said third set of flow channels from the open first axial ends
thereof to the open second axial ends thereof, and directing another different portion of
5 said exhaust flow into the open first axial ends of said second set of flow channels and
then filtering said other portion of said exhaust flow by passage through said wall
segments of said filtering section and then directing said other portion of said exhaust
flow out of the open second axial ends of said first set of flow channels.

36. The method according to claim 34 comprising directing exhaust flow
axially through said third set of flow channels from the open first axial ends thereof to
the open second axial ends thereof, then reversing exhaust flow and directing the
exhaust flow into the open second axial ends of said first set of flow channels and then
5 filtering the exhaust by passing the exhaust flow through said wall segments of said
filtering section and then directing the exhaust flow out of the open first axial ends of
said second set of flow channels.

37. The method according to claim 34 comprising directing exhaust flow
into the open first axial ends of said second set of flow channels and then filtering the
exhaust by passing the exhaust flow through said wall segments of said filtering section
and then directing the exhaust flow out of the open second axial ends of said first set of

- 5 flow channels and then reversing exhaust flow and directing the exhaust flow through said third set of flow channels from the open second axial ends thereof to the open first axial ends thereof.